

Session 1881, drawing attention, under the chief heads of the subject, to the facts and opinions elicited from the examination of a large number of competent witnesses.

Experimental inquiries, which will be the subject of a further report, have been instituted for the purposes of testing the various safety-lamps in use, as well as the numerous modifications recently proposed, and of determining the effect of coal-dust in causing or aggravating explosions. From time to time also experiments have been made with a view to substitute, in the breaking down of coal, some other means for the gunpowder shots which have so often, by their flame, caused the ignition of fire-damp.

The presence of a powerful "blower" of natural gas at the Garswood Hall Colliery, near Wigan, with the facilities offered by the proprietors, induced the Commission to erect suitable apparatus for a long series of these trials, and now that it appears desirable to compare the results with what may be obtained in another district and with a differently constituted fire-damp the whole of the apparatus is in course of erection at a colliery in the Rhondda Valley, where a very permanent "blower" offers similar advantages.

In the course of the lamp experiments it came out very clearly, in confirmation of statements before made, that the greatly augmented ventilation in our larger modern collieries has put an end to the fancied security of the simple Davy and Clanny lamps. Their use in fact, unless they be protected by some farther contrivance, is attended with the most imminent risk when the velocity of a current liable to be rendered explosive, exceeds six feet a second. A high degree of importance thus attaches to the comparative trials of lamps in which the flame is sufficiently shielded against the impinging stream of air, and those which have the property when immersed in an explosive mixture, of rapidly quenching both the flame of the wick and of the burning fire-damp.

The terrible disaster which occurred in September, 1880, at the Seaham Colliery, drew more anxious attention than ever to the question of the part played by coal-dust, and a special reference having been made by the Secretary of State for the Home Department to Prof. Abel, C.B., the experiments at Garswood Hall were largely extended. Some of the results were very remarkable; the proportion of fire-damp present with the air may be so small as to elude detection by the ordinary test of the carefully watched flame in the safety-lamp, and yet the presence of dust in suspension will cause rapid ignition, or even explosion, in a degree varying with the proportion of gas and the velocity of the current. Dust was employed from different parts of the works of several collieries where it was suspected that this agent had borne a serious part in intensifying and spreading explosions; and it was found that some of the varieties were far more sensitive than others. Certain kinds of dust, in themselves perfectly non-combustible, were similarly tested, and proved to have an analogous effect in promoting explosion, even when the percentage of gas was exceedingly small.

It is obvious from these facts that under certain conditions it is very important that a satisfactory indicator of minute proportions of fire-damp should be employed; and the further experiments proposed to be carried out by the Commission will include a particular inquiry into this subject.

The question of the feasibility of the introduction of the electric light into the workings of a colliery has been partially solved. The Stanton Coal and Iron Company were induced by the Commission to make a trial of Mr. Swan's lamps in their Pleasley Colliery, near Mansfield. Not only the inset and main road, but some of the "long-wall" faces of work, were brilliantly lighted in this manner. A second experiment of the same kind has been carried out at the Earnoch Colliery, near Hamilton.

The use and abuse of explosives in mining operations have in the last few years formed a subject of much inquiry, especially with reference to the firing of shots in coal-seams liable to be invaded by fire-damp. A return to mere wedging in all cases, as proposed by some officials, would be to ignore the advance of science as well as the necessities caused by competition; and the Commission hopes by further examination, and especially by practical trials, to contribute useful information to the solution of a difficult but important question.

Among the applications of scientific apparatus the employment of the ingenious protected lime-light lamp, and of the portable breathing arrangement of Mr. Fleuss, during the operations for re-opening of parts of the Seaham Colliery, deserves special notice.

## UNIVERSITY AND EDUCATIONAL INTELLIGENCE

CAMBRIDGE.—Messrs. W. M. Hicks and W. W. R. Ball are appointed Moderators in the Mathematical Tripos for the year beginning next May. The Senior Wranglership will in future be adjudged in June.

The Examiners for the Natural Sciences Tripos in 1882 are Lord Rayleigh, Prof. W. J. Lewis, Prof. Morison Watson (Owens College), Drs. Gaskell, R. D. Roberts, and Vines, Mr. A. G. Vernon Harcourt (Oxford), and Prof. A. M. Marshall (Owens College).

Mr. R. T. Glazebrook, Demonstrator of Experimental Physics, is approved as a Teacher of Physics, and Mr. A. S. Lea, Lecturer at Caius College, is approved as a Teacher of Physiology for the purpose of Medical Studies.

Clare College offers a Natural Science Scholarship, examination March 28; subjects: Chemistry, Chemical Physics, Botany, Geology. Candidates must give notice a fortnight previously to the tutor.

GLASGOW.—The matriculations for the present session number 2316, distributed among the various Faculties as follows, viz.:—In Arts 1327, in Medicine 624, in Law 211, in Theology 100, in Arts and Medicine 25, in Arts and Law 9, in Arts and Theology 20. The total number of matriculations last session was 2304, distributed as follows:—In Arts 1406, in Medicine 563, in Law 189, in Theology 85, in Arts and Medicine 29, in Arts and Law 18, in Arts and Theology, 14.

## SCIENTIFIC SERIALS

*Journal of the Franklin Institute*, October.—Experiments on the strength of wrought iron and steel at high temperatures, by Mr. Roelker.—On the proper method of expansion of steam and regulation of the engine, by Prof. Thurston.—On the last experiment with the Perkins machinery of the anthracite, by Ch. Eng. Isherwood.—Radio-dynamic facts, by Dr. Chase.—Universal energy of light, by the same.

*Annalen der Physik und Chemie*, No. 10.—Photometric researches on absorption of light in isotropic and anisotropic media, by C. Pulfrich.—On the vapour-tension of mixed liquids (continued), by D. Konowalow.—On the heat of formation of water, by A. Schuller.—On the heat-conductivity of gases and its connection with temperature, by L. Graetz.—Past observations on the expansion of water by heat, by P. Volkmann.—On the theoretical determination of vapour-pressure and volumes of vapour and liquid, by R. Clausius.—On heat-conduction in a system of cylinders, and on the experimental determination of the conductivity of water, by H. Lorberg.—On magnetic reaction, by F. Auerbach.—Application of the balance to the problem of gravitation, by Ph. v. Jolly.—On the spectra of hydrogen and acetylene, by A. Wüllner.—Some remarks on Herr Wesendonck's experiments on spectra of carbon compounds, by the same.—The minimum of deflection of a ray of light in a prism, by K. H. Schellbach.—Contribution to history of natural sciences among the Arabians, by E. Wiedemann.

*La Natura*, Nos. 21 and 22, November.—The Italian section at the Paris Electrical Exhibition, by R. Ferrini.—Thermal radiation of the sun, &c. (continued), by C. Cattaneo.—On the origin of electricity of storm-clouds and of the air, and on electricity in general, by F. G. Nachs.

## SOCIETIES AND ACADEMIES

### LONDON

Royal Society, November 17.—"Researches on Chemical Equivalence." By Edmund J. Mills, D.Sc., F.R.S., and J. H. Bicket. Part IV.: Manganous and Nickleous Sulphates.

The authors have examined the precipitability and precipitation of manganous and nickleous sulphates, alone or commixed, by means of sodic carbonate. The chemical events they describe are represented in a series of four hyperbolas, whose equations are given in the memoir. They sum up their results as follows:—(1) Precipitability is a linear function of mass; (2) when the commixed sulphates are precipitated by sodic carbonate, equal weights of them are equally precipitable, the attraction of one of them for the reagent being the inverse of that of the other; (3) when the sulphates are separately precipitated by the same reagent, they are equally precipitable, and do

not exhibit the inverse function; (4) there is some evidence that the precipitabilities of the commixed and separate sulphates are mathematically related in a simple manner; (5) within moderate limits precipitation is not traceably affected by temperature.

"Researches on Chemical Equivalence." By Edmund J. Mills, D.Sc., F.R.S., and Bertram Hunt. Part V.: Nickelous and Cadmic Sulphates.

This series of experiments had for its object the comparison (as in Part IV.) of nickelous sulphate with a sulphate belonging to another group. The precipitability equations for the commixed salts are given; and it is shown that, according to these, nickelous and cadmic sulphates do not admit of comparison as equally precipitable substances. The authors say, in conclusion, "Our present inference with regard to the precipitability of nickelous-cadmium salt will lead (if confirmed by the action of reagents other than sodic carbonate) to the following important criterion:—*Two elements belong to the same group when, in saline solutions of identical genus, they may be equally precipitable.*"

"Note on the reversal of the Spectrum of Cyanogen," by Professors Liveing and Dewar.

The authors have frequently noticed dark shaded bands which appeared to be the reversals of bands of oxides or chlorides of sundry metals, but only recently have they obtained photographs showing the reversal of the violet and ultra-violet flutings of cyanogen. The most complete reversal of these flutings were obtained by the use of a Siemens' machine in a crucible of magnesia fed with cyanide of titanium. No other cyanide has been found to produce this effect, but borate of ammonia has produced the reversal of the strongest group near I. In one case the reversal was produced by the bright background given by the expanded lines of magnesium when that metal was introduced. Probably the great stability of titanic cyanide and boron nitride has an influence on the result. The difficulty in reproducing the reversal at will is in securing an absorbing stratum of sufficiently high temperature, and at the same time a sufficiently bright background.

Geological Society, November 16.—R. Etheridge, F.R.S., president, in the chair.—Dr. T. Sterry Hunt, who was present as a guest, gave some account of the pre-Cambrian or Eozoic rocks of Europe as compared with those of North America. He had on several occasions studied them, both on the Continent and in the British Isles, especially with Dr. Hicks in Wales in 1878. In North America the recognised base is a highly granitoid gneiss, without observed limestones, which he has called the Ottawa gneiss, overlain, probably unconformably, by the Grenville series of Logan, consisting chiefly of granitoid gneisses, with crystalline limestones and quartzites. These two divisions make up the Laurentian of Canada, and correspond respectively to the Lewisian and the Dimetian of Hicks. Resting in discordance on the Laurentian, we find areas of the Norian or Labrador series (Upper Laurentian of Logan), chiefly made up of anortholite rocks, granitoid or gneissoid in texture, with some true gneisses. The Huronian is seen to rest unconformably on the Laurentian, fragments of which abound in the Huronian conglomerates. To the lower portion of the Huronian the speaker had formerly referred a great series of petrosilex or hallefinta rocks, described as inchoate gneisses, passing into petrosilex-porphyrries, occasionally interstratified with quartzites. This series, in many places wanting both in Europe and America, he is now satisfied forms an underlying unconformable group—the Arvonian of Hicks. Above the Huronian is the great Montalban series, consisting of grey tender gneisses and quartzose-schists, both abounding in muscovite, occasionally with hornblende rocks. The Pebidian of Hicks includes both the Huronian and the Montalban, to which latter belong, according to the speaker, certain gneisses and mica-schists both in Scotland and in Ireland, as he had many years since pointed out. In some parts of North America he found the Montalban resting unconformably on Laurentian. Above the Montalban comes the Taconian (Lower Taconic of Emmons), a series of quartzites and soft micaceous schists, with dolomites and marbles. All these various series are older than the Lower Cambrian (Menavian) strata of North America; and it may be added that the Keweenaw or great copper-bearing series of Lake Superior there occupies a position between the Montalban and the Cambrian. In the Alps the speaker recognises the Laurentian, Huronian, and Montalban, all of which he has lately seen in the Biellese, at the foot of Mont Viso, in Piedmont. The Huronian is the great *pietre verdi* group of the Italians, and much of what has been called altered Trias in this region is, in his opinion, prob-

ably Taconian. The Montalban forms the southern slope of Mont St. Gothard, and is the muscovite gneiss and mica-schist of the Saxon Erzgebirge. Here Dr. Credner and his assistants of the Geological Survey have described abundant conglomerates holding pebbles of Laurentian rocks imbedded in the Upper or Montalban gneiss. The pre-Cambrian age of this has been shown by Credner, who has proved by careful survey that the so-called younger or Palaeozoic gneisses of Naumann are really but a continuous part of the older series. Late surveys also show that the crystalline rocks of the Taunus are really Eozoic, and not, as formerly maintained, Devonian in age. The speaker insisted upon the fact that where newer strata are in unconformable contact with older ones, the effect of lateral movements of compression, involving the two series, is generally to cause the newer and more yielding strata to dip towards and even beneath the edges of the older rock, a result due to folds, often with inversion, sometimes passing into faults. This phenomenon throws much light on the supposed recency of many crystalline schists.—The following communications were read:—Additional evidence on the land plants from the Pen-y-glog slate-quarry, near Corwen, by Henry Hicks, M.D., F.G.S.—Notes on *Protolaxites* and *Pachytheca* from the Denbighshire grits of Corwen, North Wales, by Principal Dawson, LL.D., F.R.S., F.G.S.

Zoological Society, November 29.—Dr. A. Günther, F.R.S., vice-president, in the chair.—A letter was read from Dr. A. Frenzel announcing his success in breeding parrots of the genus *Eolactes* in his aviary at Freiberg, in Saxony.—A communication was read from Dr. A. B. Meyer, C.M.Z.S., containing the description of a new species of *Eolactes* received from Timorlaut Island, which he proposed to name *Eolactes riedeli*.—Mr. R. Bowdler Sharpe read a note on the genera *Schaniicola* and *Catriscus*, and pointed out that these genera were identical, but that the South-African *S. apicalis* was specifically distinct from the Indian *S. platyura*.—Mr. G. A. Boulenger gave the description of a new species of *Anolis* from Yucatan, proposed to be called *Anolis beckeri*.—Mr. W. A. Forbes gave an account of the observations he had made on the temperature of the Indian Python (*Python molurus*) during her incubation in the Gardens of the Society in June and July last. The result arrived at was that in the present case there was a difference on the whole average of about 1°·4 Fahr. in favour of the female as compared with the non-incubating male when the temperature was taken on the surface, and of more than double that amount when the temperature was taken between the folds of the body.—Dr. Gwyn Jeffreys, F.R.S., F.Z.S., read the fourth of his series of papers on the Mollusca procured during the expeditions in H.M.S.S. *Lightning* and *Porcupine*, 1869 and 1870. This part concluded the Conchifera or Bivalves. Eighteen additional species, chiefly belonging to the genus *Neara*, which is peculiar to deep water, were described. The geographical, hydrographical, and geological distribution, as well as the synonymy of all the species named in the paper, were treated of.—A communication was read from Dr. G. Hartlaub, describing the birds collected in Socotra and Southern Arabia by Dr. E. Riebeck. Amongst the Socotran birds was an example of a new species of finch of the genus *Rhynchostruthus*, which he proposed to call, after its discoverer, *R. riebecki*.

Royal Microscopical Society, November 9.—J. W. Stephenson, vice-president, in the chair.—The Rev. J. J. Halley, vice-president of the Microscopical Society of Victoria (one of the affiliated societies), attended the meeting, and gave an account of the progress of biology and microscopy in that colony.—Mr. Stephenson exhibited a slide of *Surirella gemma*, mounted in phosphorus, illustrating in a remarkable manner the advantage of mounting in media of high refractive index. Mr. Crisp, Mr. Crossley, and Mr. Watson exhibited various forms of microscopes and apparatus, and Mr. Mayall an Abbe apertometer of dense glass for measuring apertures up to 1·50 N.A., and a plate ruled by Fasoldt of New York, who claims to be able to rule lines up to 1,000,000 in the inch.—The deaths of M. Nachet, sen., of Paris, and Mr. C. A. Spencer of Geneva, N.Y., were announced.—Two papers were read by Dr. B. Wills Richardson on multiple staining of animal and vegetable tissues, and by Dr. L. G. Mills on diatoms from Peruvian guano; and Mr. T. Charters White exhibited and explained Goodwin's growing slide.—Eight new Fellows were elected.

Anthropological Institute, November 22.—Mr. Hyde Clarke, vice-president, in the chair.—The election of C.



Pfounds was announced.—Mr. E. B. Tylor, F.R.S., read a paper on the Asiatic relations of Polynesian culture. The author called attention to some new evidence relating to the transmission of civilisation from the Indo-Chinese district of Asia through the Indian Archipelago to Melanesia and Polynesia. The drawings of wooden tombs in Borneo by Mr. Carl Bock show architectural design, apparently derived from the roof-projections of pagodas of Cochin China. The flute played with the nostrils may be traced from India (where it is said to have a ceremonial use to prevent defilement through touching a low-caste mouth), through South-east Asia into Borneo, to the Fiji Islands, and down to New Zealand. Among the traces of mythical ideas having spread from Asia into the South Sea Islands, Mr. Tylor mentioned the notion of seven or ten heavens and hell, apparently derived from the planetary spheres of the Pythagoreans. The Scandinavian myth of the fishing up of the Midgard serpent bears, as Prof. Bastian of Berlin has pointed out, a striking resemblance to Maui's fishing up the Island of New Zealand, and the Maori myth of the separation of heaven and earth has one of its best representatives among the Dayaks of Borneo. Leaving the question of race on one side, it is becoming more and more certain that much of the culture of the Polynesians came in some way from civilised nations of Asia.—The following papers were also read:—On Fijian riddles, by the Rev. Lorimer Fison.—On the stature of the inhabitants of Hungary, by Dr. J. Beddoe.—Notes on the affinity of the Melanesian, Malay, and Polynesian Languages, by the Rev. R. H. Codrington.—The discussion on Mr. Codrington's paper was adjourned to the next meeting, on December 13.

**Institution of Civil Engineers, November 22.**—Mr. Abernethy, F.R.S.E., president, in the chair.—The paper read was on the "Forces and Strains of Recoil considered with reference to the Elastic Field-Gun Carriage," by Mr. H. J. Butter.

**Victoria (Philosophical) Institute, December 5.**—The first meeting of the new session was held at the Institute's House, 7, Adelphi Terrace, on Monday evening, when a paper on Mr. Herbert Spencer's "Theory of the Will" was read.

#### PARIS

**Academy of Sciences, November 28.**—M. Wurtz in the chair.—M. Faye presented the volume of the *Connaissance des Temps* for 1883.—The following papers were read:—New method of annulling the astronomical flexure of telescopes, by M. Villarceau. The simultaneous application to a well-made telescope of two weights in equilibrium, causes a variation of the astronomical flexure, proportional to their difference. Two iron rings, of fixed weight, are applied at distances from the axis of rotation, that are determined by formula.—On the isomeric states of haloid salts, by M. Berthelot.—Summary account of a zoological exploration in the Mediterranean with the Government vessel *Le Travailleur*, by M. Milne-Edwards. This expedition, organised by M. Milne-Edwards, left Rochefort on June 9, and returned August 19. Part of June and all July was devoted to the deeper parts of the Mediterranean. *Inter alia*, many Crustaceans, known only in the Atlantic before, were got in those depths; also remarkable species of Mollusca, Bryozoa, Coelenterata, &c. The presence of the magnificent sea-star *Brisinga* was quite unexpected; several specimens were dredged between 550 and 2660 m. No Infusoria, Bacteria, or Microbes were found at great depths; Rhizopods were rare; at 2660 m. some small Actinophrys were obtained. In general the Mediterranean is not to be thought a distinct geological province; its inhabitants have probably come from the ocean, and their development and reproduction have been more active than in their place of origin. Some have been slightly modified. The more we get to know of oceanic productions off the coasts of Portugal, Spain, Morocco, and Senegal, the more do differences from Mediterranean animals disappear.—Fossil man of Lagoa Santa (Brazil), and his present descendants, by M. de Quatrefages. Several human crania were long ago found in a cavern near Lagoa Santa, by Dr. Lund, a Danish *savant*. His letter about them (1844) seems to have been forgotten. Most were sent to Copenhagen, but have not been described. One remaining in Brazil has been studied by Drs. Lacerda and Peixoto, who find the skull to have strong points of similarity to skulls of Botocudos of the present. This M. de Quatrefages confirms, and he further finds the type quite distinct from European fossil man, chiefly in the combinations of dolichocephaly and hypsistenocephaly. This Brazilian fossil man lived in the reindeer epoch. The type (with added ethnic elements not yet determined) is now met with in Ando-

Peruvian populations, as well as in Brazil.—Admiral Paris presented a second series of his "Souvenirs de Marine Conserves," plates of old or disappearing types of vessels, comprising Danish ships previous to the siege of Copenhagen, Arab vessels, French fishing-boats, Turkish boats, &c.—Researches on a new property of the nervous system, by M. Brown-Séquard. Various parts of the nervous system may act suddenly, or very rapidly, in a purely dynamic way and without intervention of nutrition, on other parts of this system, so as to increase the power of action of those parts. Thus, *e.g.* by irritation of the skin the excitability of the phrenic nerve of the same side may be at once so increased that the minimum faradic current then required to set the nerve in action may be only one-sixth of that for the same nerve in a similar animal whose cutaneous nerves have not been irritated.—Observation of the new comet (*g* 1881) at Paris Observatory, by M. Bigourdan.—On algebraic equations of the form

$$\frac{A_0}{x-a_0} + \frac{A_1}{x-a_1} + \dots + \frac{A_n}{x-a_n} = 0,$$

by M. Laguerre.—Distribution of energy by electricity, by M. Deprez.—Decomposition of vapour of water by electric effluves, by MM. Deherain and Maquenne. They show that certain electric discharges without sparks, and at a comparatively weak tension, will decompose water. They used sometimes MM. Thenard and Berthelot's well-known apparatus with double glass envelope, sometimes a tube traversed by a play tinum wire, and having some tinfoil outside.—Contribution to the pathological anatomy of the spinal cord in poisoning with phosphorus, by M. Danillo. With phosphorus inflammation may be produced either in the grey substances alone, or both in that and in the white.—Reply to a note of M. Isambert on carbamate of ammonium, by MM. Engel and Moitessier.—On the post-embryonal development of Diptera, by M. Künckel.—On an electrolytic dosimeter for measuring the intensity of the current during medical application of electricity, by M. Pulvermacher. The gases produced by decomposition of water are admitted into a chamber where they act on coloured water, forcing it up a tube to which a graduated scale is attached.—Mr. Axon communicated some facts about articulation by deaf mutes, confirming M. Hémet's observations.—M. Bousset reported a curious case of double parturition by a cow.

#### VIENNA

**Imperial Institute of Geology, Nov. 22.**—The following papers were read:—R. Hoernes, contributions to the knowledge of mid-Meiocene *Trionyx* species in Styria.—Standfest, on the Devonian formation in the environs of Gratz.—F. Kreutz, contributions to the explanation of the ozokerite and naphtha occurrence in Galicia.—T. Woldrich, contributions to the knowledge of the fauna of Moravian caves.—E. Reyer, on the eruptive rocks of Toscana and Elba.

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